

distribution of various types of leaves in the principal phytogeographic regions, having in view "the question of the conservatism of foliar characters and their modification by environmental factors." The present paper summarizes the results from data obtained in reference to the distribution of entire and non-entire leaves and leaflets of dicotyledons. The authors conclude that there is a marked correlation between leaf margin and environment in the distribution of dicotyledons. Entire margins predominate in lowland tropical regions; while non-entire margins predominate in mesophytic cold-temperate regions. In the tropics non-entire margins are favored by "moist uplands, equitable environments, and protected, comparatively cool habitats." In the cold temperates, entire margins are favored by "arid environments and other physiologically dry habitats." These correlations are exhibited more strikingly by trees and large shrubs than by herbs. If these conclusions are tenable, "the determination of the percentages of the entire and non-entire leaves in Cretaceous and Tertiary dicotyledonous floras affords a simple and rapid means of gauging the general climatic conditions." Attention is called to the danger of inferring that leaves are conservative or inconstant because in some cases they remain unaltered through long periods, and in other cases they vary greatly among closely related forms. A very definite relation between the evolution of climate and the evolution of plants is becoming increasingly evident.—J. M. C.

**Embryo sac of Onagraceae.**—The embryo sac of this family, the subject of a good many investigations, has been reported as persistently 4-nucleate, with an occasional more or less doubtful exception. TÄCKHOLM<sup>12</sup> has investigated the situation and confirms the constancy of this feature, stating that he never observed an embryo sac that was not 4-nucleate, nor did he find any transition stages to the ordinary 8-nucleate type. Previous statements in reference to vanishing antipodals, thus reducing the number of nuclei to 4, are thought to be accounted for by confusing them with the remnants of the 3 lower megaspores, the uppermost megaspore in this family developing the embryo sac. In fact, it seems that one or more of the 3 lower megaspores often persist attached to the embryo sac, and this sometimes results in a striking resemblance to 3 antipodals in a linear series. This union of persistent megaspores with the embryo sac constitutes what TÄCKHOLM calls a gametophytic entity, sometimes intervening walls disappearing and the persistent megaspore nuclei left free in the antipodal region of the sac. As to the possible nutritive function of these persistent and occasionally proliferating megaspore nuclei, there has been much discussion, but no certain evidence. In any event, this behavior of the Onagraceae seems to be unique, and its possible phylogenetic significance must be left at present to the imagination.—J. M. C.

<sup>12</sup> TÄCKHOLM, GUNNAR, Beobachtungen über die Samenentwicklung einiger Onagraceen. Svensk. Bot. Tidsk. 9:294-361. figs. 16. 1915.